

# Industry sector data and surveys

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# Overview of data for indicators in industry

- Activity data:
  - Production index by main branch
  - Value added by main branch (at constant price)
  - Physical production for energy intensive products
  
- Energy consumption by main branch and energy intensive products (steel, cement, pulp and paper, sugar, glass...)

- ▶ 1. **Activity data**
- 2. Energy consumption by branch
- 3. Case study: French survey EACI

# Activity data in industry : overview

- Activity data by branch are usually collected by National Statistical Offices
- The branch covered follows at national level national classifications that are usually adapted from international classifications:
  - ISIC : International Standard Industrial Classification of All Economic Activities used, developed and updated by UN;
  - NACE : Classification of Economic Activities in the European Community.
- The difficulty come from the frequent revision of classifications and the fact that time series may be defined according to different classifications (ISIC rev 4 and NACE rev 2 now )



# International classification of industrial branches (ISIC or Nace)

- Industry is broken down into 4 main sectors:
  - Section C: Mining
  - Section D: Manufacturing
  - Section E: Electricity, gas and water
  - Section F: Construction
  
- Manufacturing is disaggregated into 23 main industrial branches at the two digits levels.
  
- By going at a more detailed level (3 or 4 digits level), one can find some key branches from an energy consumption viewpoint, such as cement for instance, which is part of branch 26 (Division 26.5 including lime and plaster and 26.51 for cement alone).

## Energy consumption of manufacturing industry by branch: international classification (ISIC / Nace)

Nace code (2 digits)	
15-16	Food (15) and tobacco (16)
17-19	Textile (17), Wearing apparel (18) and Leather (19)
20	Wood
21-22	Paper (21) and printing (22)
24-25	Chemicals (24), Rubber & plastics (25)
26	Non metallic Minerals
27	Primary metals (steel, non ferrous)
28	Fabricated metallic products
29	Machinery and equipment
30-33	Office equipment (30), electrical machinery (31), communication equipment (32), optical (33)
34-35	Motor vehicles (34) and transport equipment (35)
36-37	Others (furniture,...)

Refineries and coking plants (Division 23) excluded;

# Activity data in industry : production index

- Measure the changes in the volume of physical production in relation to a base year → index base 100 in 2000 for instance
- Measured at a very detailed level (4 to 5 digits) on the basis of physical production in different units (e.g. number of litres of milk processed , of tons of meat produced for the food industry)
- Are aggregated at the 2 digits branch level (e.g. food) on the basis of the weight of each sub-branch in the value added of the branch in the base year (2000)
- Most common indicator used to measure the industrial output (monthly monitoring)
- Published by all National Statistical Offices
- To fit energy consumption classification (e.g. to combine the index of food and tobacco into one index for “food & tobacco”), cannot be aggregated but should be calculated as a weighed average using the weight of each branch

# Activity data in industry : value added

- Should be measured at constant price
- Published by National Statistical Offices often in current prices, sometimes also at constant price
- If constant price not available, data may be given with price index by branch and/or index of volume by branch → can be used to calculate value added values at constant price (see next slide)



# Calculation of value added at constant price

- If price index by branch are available:
  - Use of branch specific deflators (price index) or annual variation in price by branch
  - Example :  $VA_{xx(t=2005)} = VA / DEFL * DEFL_{(t=2005)}$   
with XX reference of constant prices ; DEFL: branch deflator
- If index of volume exist for value added\* (or a growth rate compared to previous year in volume) :
  - This index actually measure the change in the value added at constant price
  - Example :  $VA_{xx(t)} = VA_{(t-1)} * DEFL * DEFL_{(t=2005)}$

\* Can be replaced by the production index if not available (see previous slide)

# Activity data in industry : physical production for energy intensive branches

- Published usually by National Statistical Offices
- Also available from national industry associations, regional industry associations (e.g. Cembureau in Europe for cement, <http://www.cembureau.be> ) and international associations (e.g. World Steel Association <http://www.worldsteel.org>)
- Very well updated
- Can only be defined for homogenous industrial branch with a dominant output

- 1. Activity data
- ▶ 2. **Energy consumption by branch**
- 3. Case study: French survey EACI

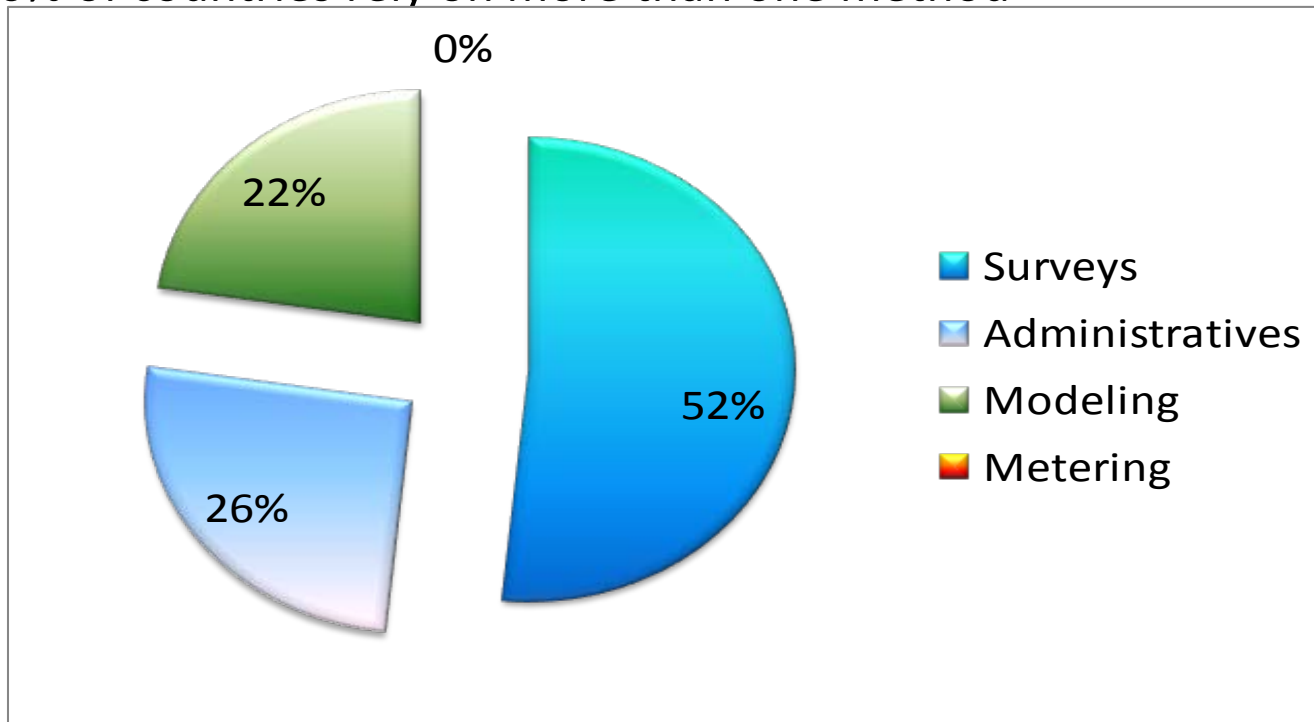
# Energy consumption by branch: main sources

Different sources of information are available:

- The most comprehensive sources are industrial surveys;
- The other source is administrative , i.e. the administration; requires utilities and/or consumers to provide the information;
- Modeling may be used to complete the information for intermediate years;
- Metering relate to audits data that can only be used at national level if the sample is representative.

# National energy consumption by branch: overview of sources for the energy balance

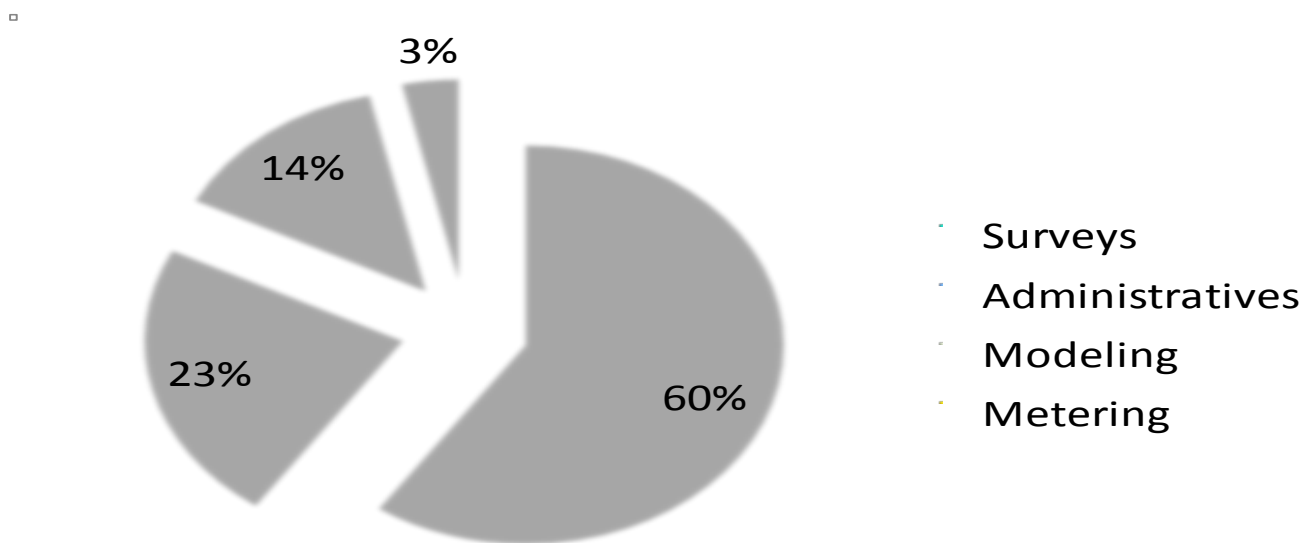
- According to an IEA consultation covering mainly OECD countries, industrial surveys represented about half of the sources of national energy consumption statistics by branch in a sample of 22 countries;
- The other main source is administrative (about one fourth)
- 30% of countries rely on more than one method



Source: AIE survey 2011 (march 2012),

# Energy consumption by branch: overview of sources

- According to the IEA consultation, out of the 36 organizations that answered\*, industrial surveys represented 60% of the sources;
- The other main source is administrative (about one fourth)
- About 1/3 of organizations rely on more than one method.



Source: AIE survey 2011 (march 2012), based on 57 methods as one source may have more than one method

\* Including other sources than official statistics in the 22 countries

# Energy consumption by branch: surveys

- Most OECD countries have annual surveys to collect data on energy consumption at branch level that usually match standards statistical classifications (ISIC, NACE)
- Surveys enable to well measure the final energy consumption through specific questions, as one difficulty is that there exist a difference between the energy purchased by industrial consumers and the final energy consumption. This difference is due to the fact that the final energy consumption excludes:
  - the diesel consumption of vehicles → included in transport sector
  - the fuels used for autoproduction of electricity or cogeneration (own production of electricity on industrial sites) → in energy transformations under production of electricity

# Energy consumption by branch: surveys

- Surveys usually carried out by the National Statistical Office, with two formats:
  - Data collected on fuels purchased in monetary values, as part on usual surveys on industrial activity (e.g. UK, Ireland)
  - Dedicated surveys on energy consumption with data on energy consumption in physical units (e.g. France, Austria, The Netherlands), mostly mandatory, but also voluntary (e.g. Turkey).
- Generally the surveys are combined with administrative data to get the energy balance data by branch
- Surveys are useful for oil, coal and biomass and waste, as this cannot be collected from companies, as they usually do not know the final consumers and they are too many.



# Energy consumption by branch: example of surveys

- France survey, called EACI: “Enquête Annuelle sur les Consommations d'énergie dans l'Industrie »
  - France annual surveys include questions on the way energy is used (i.e. on end-use): motors, boilers, ovens etc...
  - Cover 10000 sites
  - Source : [http://www.insee.fr/fr/methodes/sources/pdf/Questionnaire\\_EACEI\\_2011.pdf](http://www.insee.fr/fr/methodes/sources/pdf/Questionnaire_EACEI_2011.pdf)
- UK survey based upon the Purchases Inquiry (PI), which is a sub-survey of the ONS' Annual Business Inquiry.
  - The Purchases Inquiry asks a sample of around 6,000 firms for their energy purchase
  - UK statistic also include data on end-uses based on another survey

# Energy consumption by branch: administrative sources

There are two forms of administrative submission of industrial energy consumption that can be actually combined:

- Submission by suppliers (e.g. utilities), especially for gas and electricity : implies a law and a similar classification between utilities ; work well if reduced number of utilities
- Submission by consumers, usually mandatory for designated consumers above a certain threshold of energy consumption (e.g. India, Algeria, Tunisia, Bulgaria)
- Submission by member of industrial trade associations to their secretariat to publish report :
  - Concerns mainly energy intensive branches usually (e.g. cement, pulp and paper, steel);
  - Not always published
  - Done also at international level by WBCSD (e.g. for cement with CSI, Cement Sustainability Initiative) (<http://www.wbcsdcement.org/>)

# Energy consumption by branch: combination of sources: case of UK

In reality there is not only one source that is used but a combination of sources:

- Surveys of suppliers give information on consumption for 12 industrial groups → administrative
- Annual Business Inquiry → survey
- EU-ETS information for energy-intensive sectors (extensive registry)
- Energy Efficiency Best Practice Programme (audits data)
- Considered for the future: linking electricity and gas meter data to the UK's business register

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# Methodology (1): main characteristics

- Mandatory under a law (of June 1951)
- Starting in the seventies, refreshing of the methodology in 2005.
- Mailing of 12000 questionnaires, based on registry of companies (Sirene) (93% response rate).
- Extrapolation for responses is different according to the size of the site.
- Personalised questionnaire .

## Methodology (2): Field of survey

Statistical unit : industrial site having a process activity. When other activities co-exist, the whole energy consumption is surveyed

- Sampling:
  - Exhaustivity for all important energy consumers in selected sectors
  - All sites with more than 10 employees for selected branches (yearly sampling rotation)
  - All sites with more than 500 employees
  - By selection for sites between 20 and 499 employees of less consuming sectors

# Questionnaire (1)

A000 general data for the site

A2 : Number of employees

A4 : Description of the main activity

E000 Fuels

B Electricity

B1 : Purchased electricity in value and quantity

B2 : Electricity own generation and destination

B3 : Breakdown of electricity by end-use (mechanical power; thermal uses; others end-uses i.e. electrolysis

B4 : Which tariff

C Heat

C1 Purchased heat in value and quantity and sold

C2 : Breakdown of heat by end-use (process; electricity generation; heating and others)

Source: [http://www.insee.fr/fr/methodes/sources/pdf/Questionnaire EACEI 2011.pdf](http://www.insee.fr/fr/methodes/sources/pdf/Questionnaire_EACEI_2011.pdf)

# Questionnaire (2)

## D Natural gas

D1 : Purchased natural gas in value and quantity

D2 : Breakdown of gas consumption by end-use (process; raw material; electricity generation; heating and others)

D3 : Which tariff

## E Network gas and other gas

E1 Purchased network gas in value and quantity

E2 : Breakdown of network gas by end uses

Process; electricity generation; raw material, heating and others

Source: [http://www.insee.fr/fr/methodes/sources/pdf/Questionnaire\\_EACEI\\_2011.pdf](http://www.insee.fr/fr/methodes/sources/pdf/Questionnaire_EACEI_2011.pdf)



# Questionnaire (3)

## F Coal

F1 : Purchased coal in value and quantity

F2 : stocks beginning and end of 2007

F3 : Breakdown of gas by end uses

Process; raw material; electricity generation; heating and others

G : Lignite and low coal (idem Coal)

H : Coke (idem coal)

I : Petroleum coke (idem coal)

J : LPG (idem coal)

K : Heavy fuel oil (idem coal)

L : Light fuel oil (excluding diesel) (idem diesel)

Source: [http://www.insee.fr/fr/methodes/sources/pdf/Questionnaire EACEI 2011.pdf](http://www.insee.fr/fr/methodes/sources/pdf/Questionnaire_EACEI_2011.pdf)

## Questionnaire (4)

M: Other petroleum products

M1 : Consumed fuels in quantity

M2 : Break-down of other petroleum fuels by end uses

Process; raw material; electricity generation; heating and others

N : Black liquors (idem other petroleum products)

O : Wood and wood products for energy uses

O1 : Consumed fuels in quantity

O2 : Breakdown of wood products by end uses

Process; electricity generation; heating and others

X : Renewables special fuels

X 1 : Consumed special fuels in quantity

X 2 : Break-down of special fuels by end uses

Process; raw material; electricity generation; heating and others

Y : Non renewables special fuels (idem special fuels)

Source: [http://www.insee.fr/fr/methodes/sources/pdf/Questionnaire EACEI 2011.pdf](http://www.insee.fr/fr/methodes/sources/pdf/Questionnaire_EACEI_2011.pdf)

# Questionnaire (5)

## Z: Other fuels

Z1 : Purchased other fuels in value, quantity and stoked

Z2 : Quantity consumed

Z3 : Break-down of other fuels by end-uses

Process; raw material; electricity generation; heating and others

Source: [http://www.insee.fr/fr/methodes/sources/pdf/Questionnaire EACEI 2011.pdf](http://www.insee.fr/fr/methodes/sources/pdf/Questionnaire_EACEI_2011.pdf)

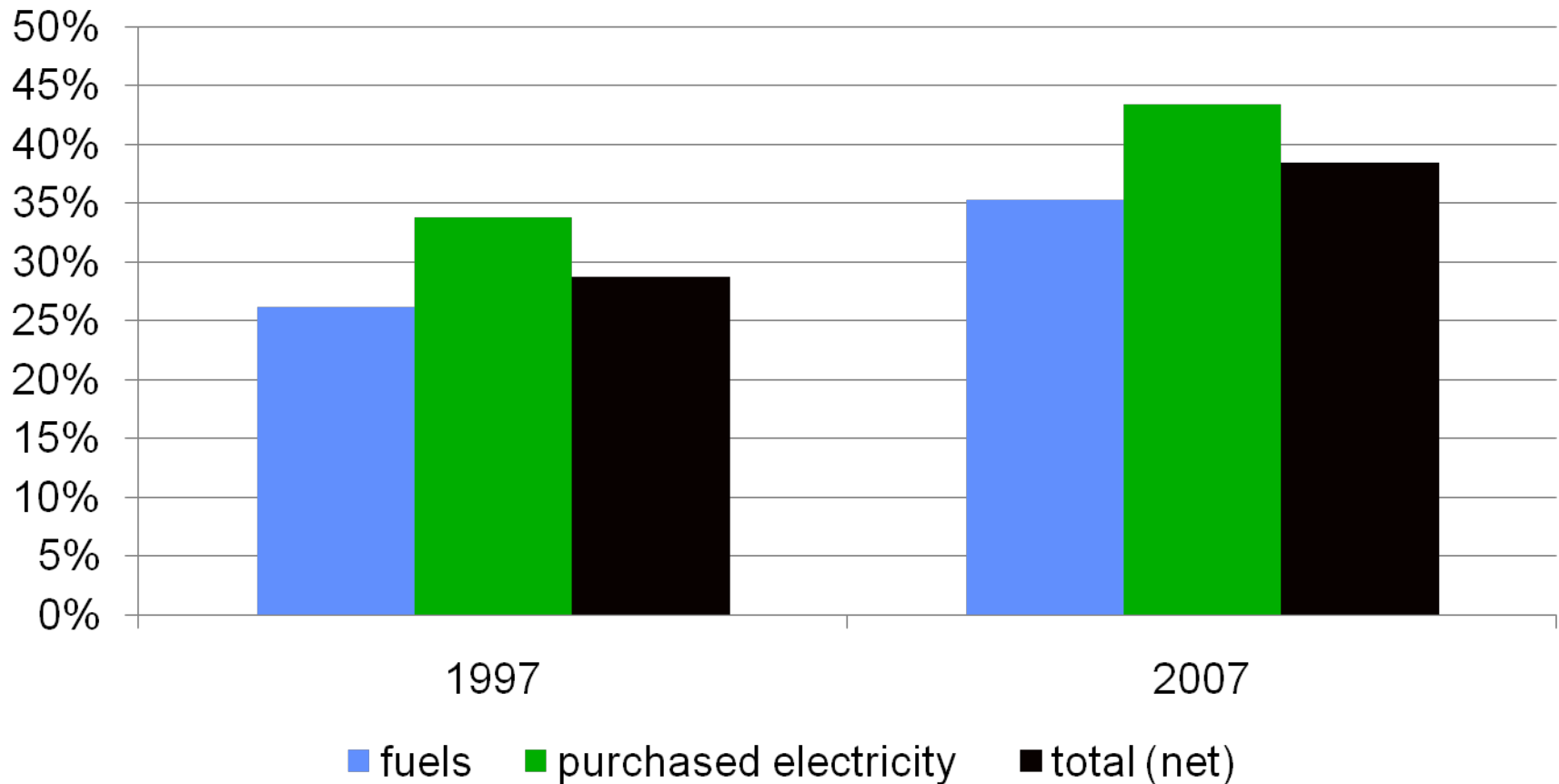
# Main published results

[http://www.insee.fr/fr/themes/detail.asp?ref\\_id=ir-eacei2010](http://www.insee.fr/fr/themes/detail.asp?ref_id=ir-eacei2010)

- Energy consumption (cross checked)
  - By energy sources (10 types including renewables and special fuels)
  - By sector (24 sectors)
  - By end use (3-4):
    - Fuels (4): process (kilns, dryers, boilers) , raw materials, electricity generation, heating and other uses
    - Electricity (3) : motors, thermal uses, other uses (e.g. Electrolysis)
  - By company size
  - By region
- Energy expenditures
- Average fuel prices of purchased energy by sector

## Example of results: energy consumption by company size (France)

Share of SME's (<250 employees): increasing role



# Remarks

- Results are published on web site with times series but are not always retropolated.
- However, not publicly available when the number of sites is too limited (< 3 companies).
- When a company change its main activity, the related energy consumption shifts to the relevant sector.
- Unit energy consumption are not calculated as such
- Results are used for the national energy balances
- Results are reworked by CEREN for ADEME
- Specific statistical treatments can be ordered

# Conclusion

- All European countries have similar annual surveys
- These surveys are used to fulfil reporting requirement to Eurostat/IEA
- Difference may come from the additional question to energy use (e.g. consumption by end-use not always asked)
- Main source of information for energy efficiency indicators by industrial branch